



# Mapping Inventory

## Purpose:

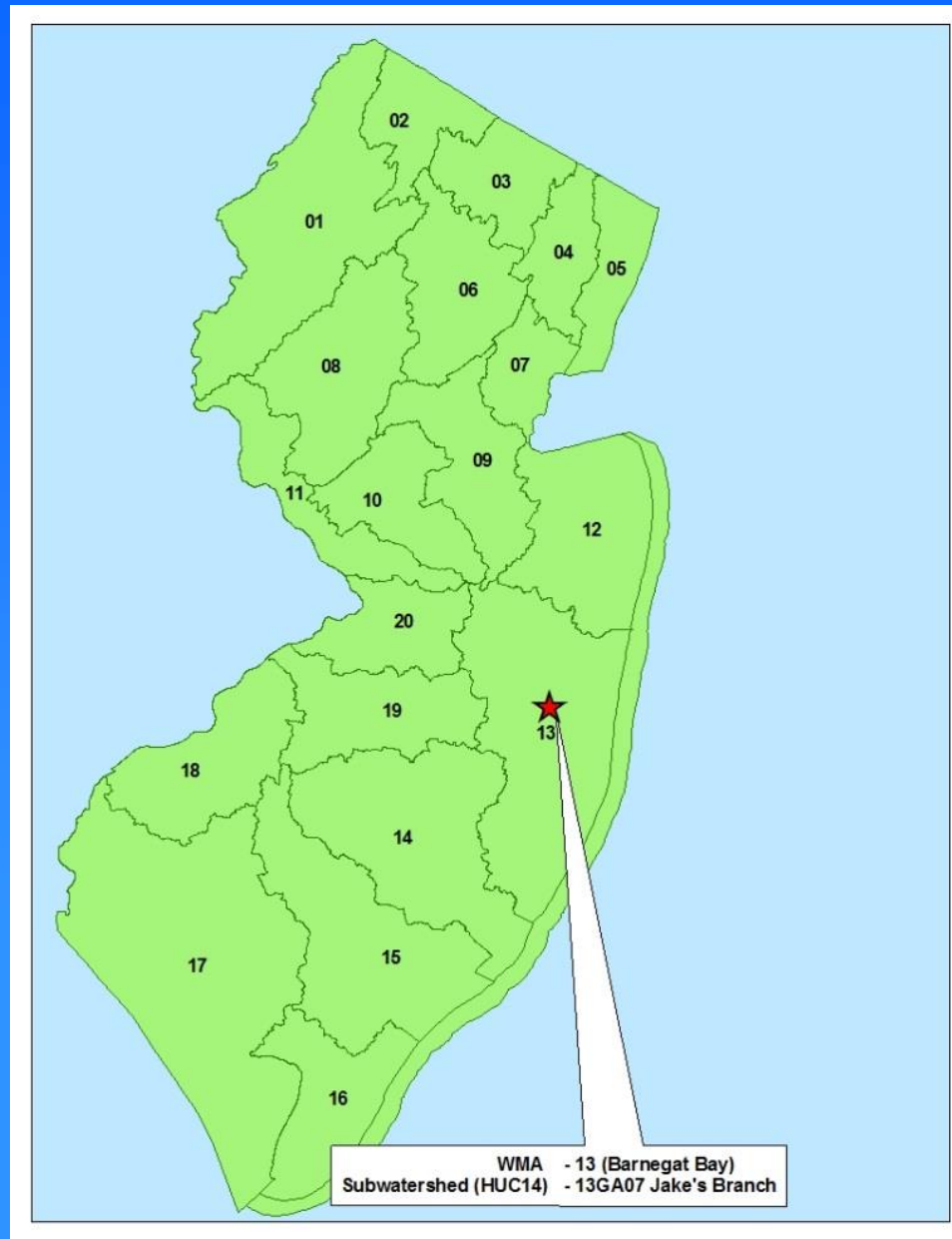
Demonstrate a methodology to effectively map and inventory stormwater infrastructure and maintain MS4 permit compliance utilizing readily available technology.

October 15, 2014

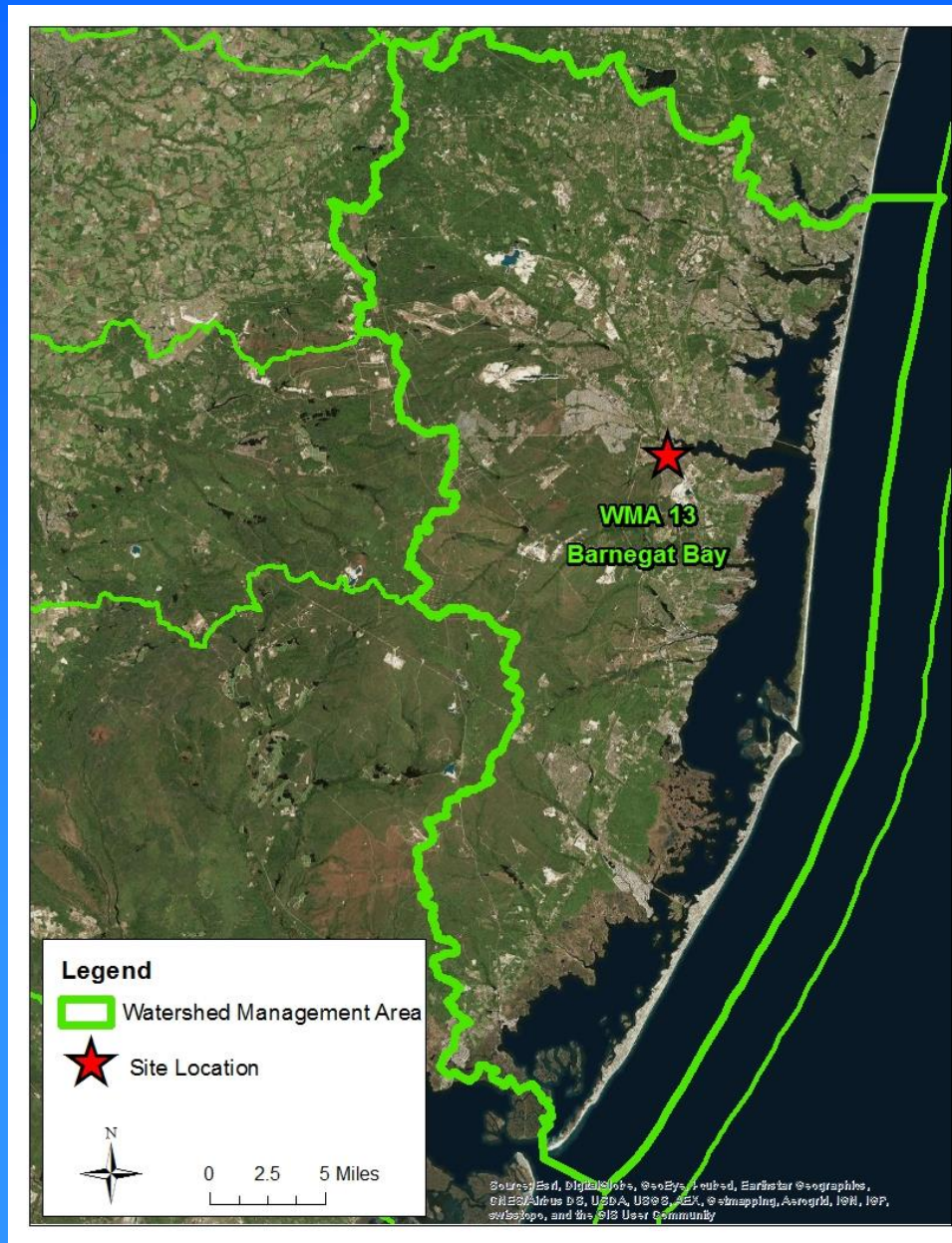
# MS4 Mapping and Inventory Requirements

- ☐ Complete and maintain outfall pipe mapping
- ☐ Inventory, inspect, and maintain outfalls, storm drains, and stormwater basins
- ☐ Identify locations of storm drain retrofits, outfall scouring, illicit discharges, and vehicle washing occurrences

# Project Area:

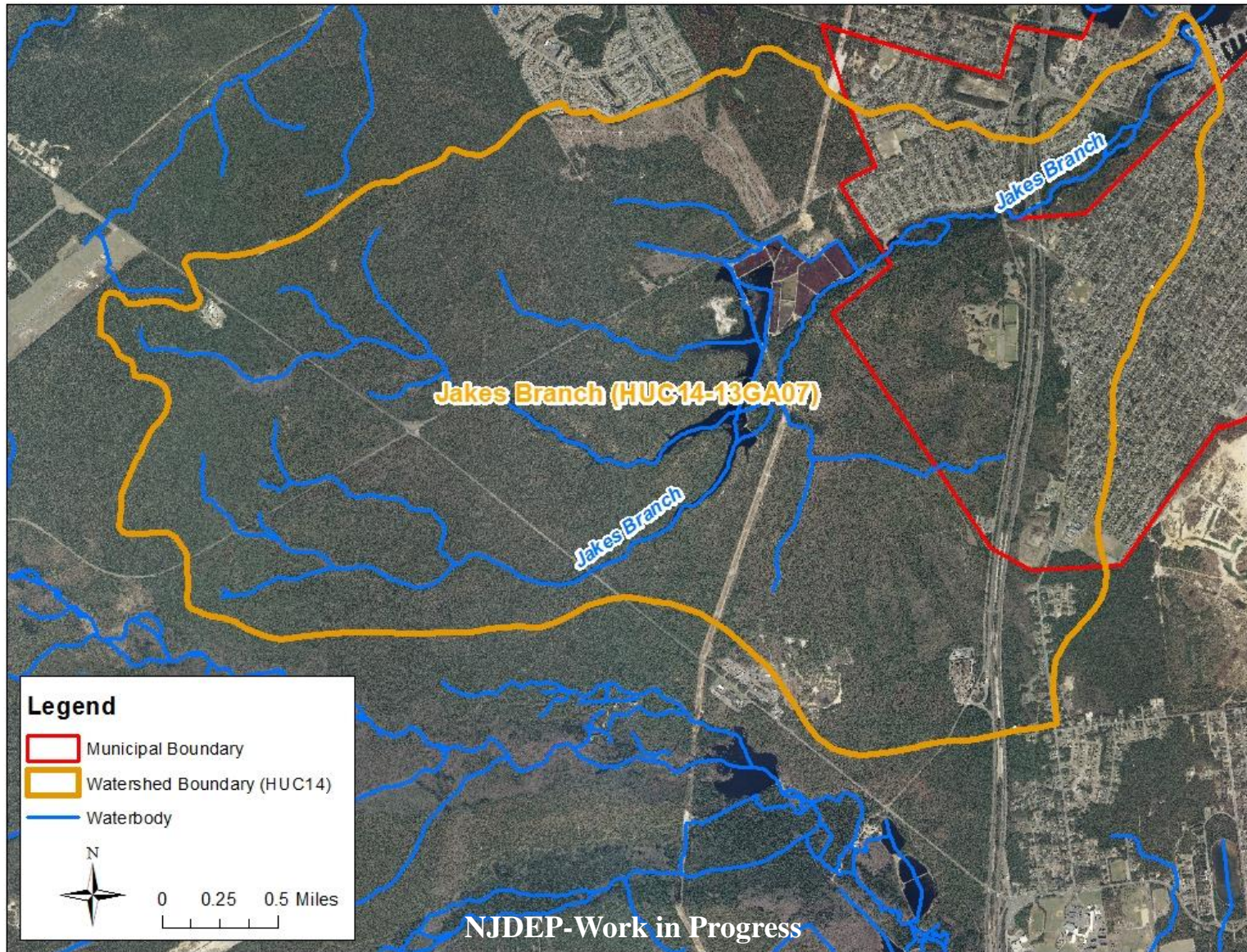


# Watershed Management Area Map





# HUC14 Map



# Method:

## Equipment Used in Study:

### GPS – Trimble Unit

- Any brand can be used but it must meet accuracy requirements
- Can be rented, purchased, borrowed, shared with other municipalities, etc.
- Layers and data dictionaries can be downloaded from NJDEP for use with Terrasync or ArcPad GPS unit

### Camera

### GIS

- Free ESRI GIS software can be obtained to review collected data
- Data submitted to NJDEP may be made available through web based applications

### MS Excel

# Method:

## Available Information Referenced:

SIIA, H&H Database, Watershed Studies, MS4  
Outfall Map, MS4 Stormwater Inventory, NJDEP  
GIS Data

## Field Verification:

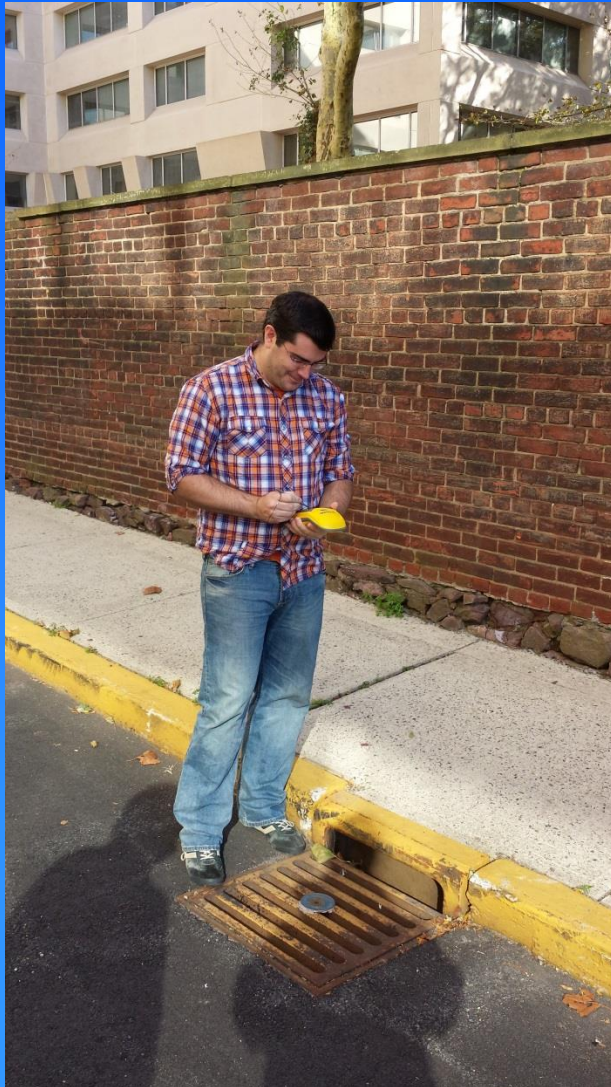
Location Mapping with GPS Unit, Outfall  
Inspections, Storm Drain Inspections,  
Stormwater Basin Inspections

## Efficiency (24 Hours)

24 Stormwater Outfalls, 403 Storm Drain Inlets,  
and 13 Stormwater Basins



# Method:



**NJDEP-Work in Progress**

FID	10
Owner	Municipality 2
Permit Type	MS4
Storm Drain ID	11
Storm Drain Description	Combination Inlet
Storm Drain Location	Street
Type Area Drained	Suburban
Inspector	Kevin Ball
Date	2014-08-12
24-Hour Precipitation	Yes
24-Hour Snow Melt	No
Curb Opening Retrofit	No
Bicycle Safe Grate	No
Storm Drain Labeled	Yes
General Comments	None
Structural Condition	Good
Label Condition	Good
Drain Grate Clogged	Yes
Storm Drain Comments	None
Drain BMP Present	No
BMP Type	N/A
BMP Effective	N/A
BMP Comment	None
Debris Present	Yes
Prevalent Debris Type	Floatables > 2" dia
Debris Source	Local Residences
Debris Comments	Area experienced flooding overnight
Standing Water	No
Outlet Clogged	No
Down Weather Flow	No
Flow Color	N/A
Flow Odor	N/A
Flow Foam	N/A
Flow Sheen	N/A
Flow Comments	None
Illegal Connection	No
Connection Source	N/A
Connection Comments	N/A
Maintenance Required	Yes
Maintenance Code	1-General Maintenance
Maintenance Comment	None
Maintenance Complete	No
Date Completed	N/A
Post Maint. Photo	N/A
Time	09:23:06am



**FID**

10

**Owner**

Municipality 2

**Permit Type**

MS4

**Storm Drain ID**

11

**Storm Drain Description**

Combination Inlet

**Storm Drain Location**

Street

**Type Area Drained**

Suburban

<b>Inspector</b>	Kevin Ball
<b>Date</b>	2014-08-13
<b>24 Hour Precipitation</b>	Yes
<b>24 Hour Snow Melt</b>	No
<b>Curb Opening Retrofit</b>	No
<b>Bicycle Safe Grate</b>	No
<b>Storm Drain Labeled</b>	Yes
<b>General Comments</b>	None
<b>Structural Condition</b>	Good
<b>Label Condition</b>	Good
<b>Drain Grate Clogged</b>	Yes
<b>Storm Drain Comments</b>	None
<b>Drain BMP Present</b>	No
<b>BMP Type</b>	N/A
<b>BMP Effective</b>	N/A
<b>BMP Comment</b>	None
<b>Debris Present</b>	Yes

<b>Debris Present</b>	Yes
<b>Prevelant Debris Type</b>	Floatables > 2"" dia
<b>Debris Source</b>	Local Residences
<b>Debris Comments</b>	Area experienced flooding
<b>Standing Water</b>	No
<b>Outlet Clogged</b>	No
<b>Dry Weather Flow</b>	No
<b>Flow Color</b>	N/A
<b>Flow Odor</b>	N/A
<b>Flow Foam</b>	N/A
<b>Flow Sheen</b>	N/A
<b>Flow Comments</b>	None
<b>Illicit Connection</b>	No
<b>Connection Source</b>	N/A
<b>Connection Comments</b>	N/A



**Maintenance Required**

Yes

**Maintenance Code**

1-General Maintenance

**Maintenance Comment**

None

**Maintenance Complete**

No

**Date Completed**

N/A

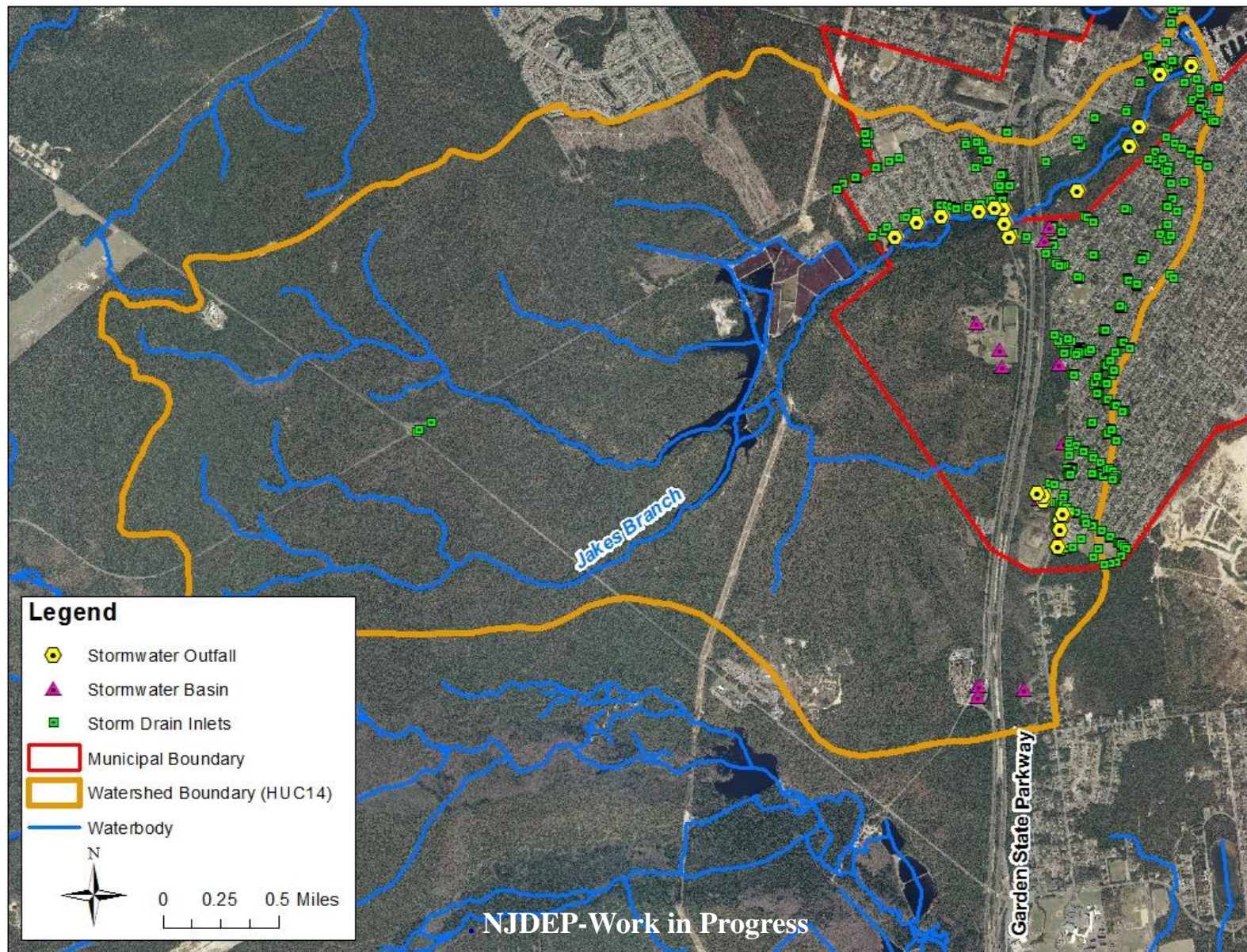
**Post Maint. Photo**

N/A

**Time**

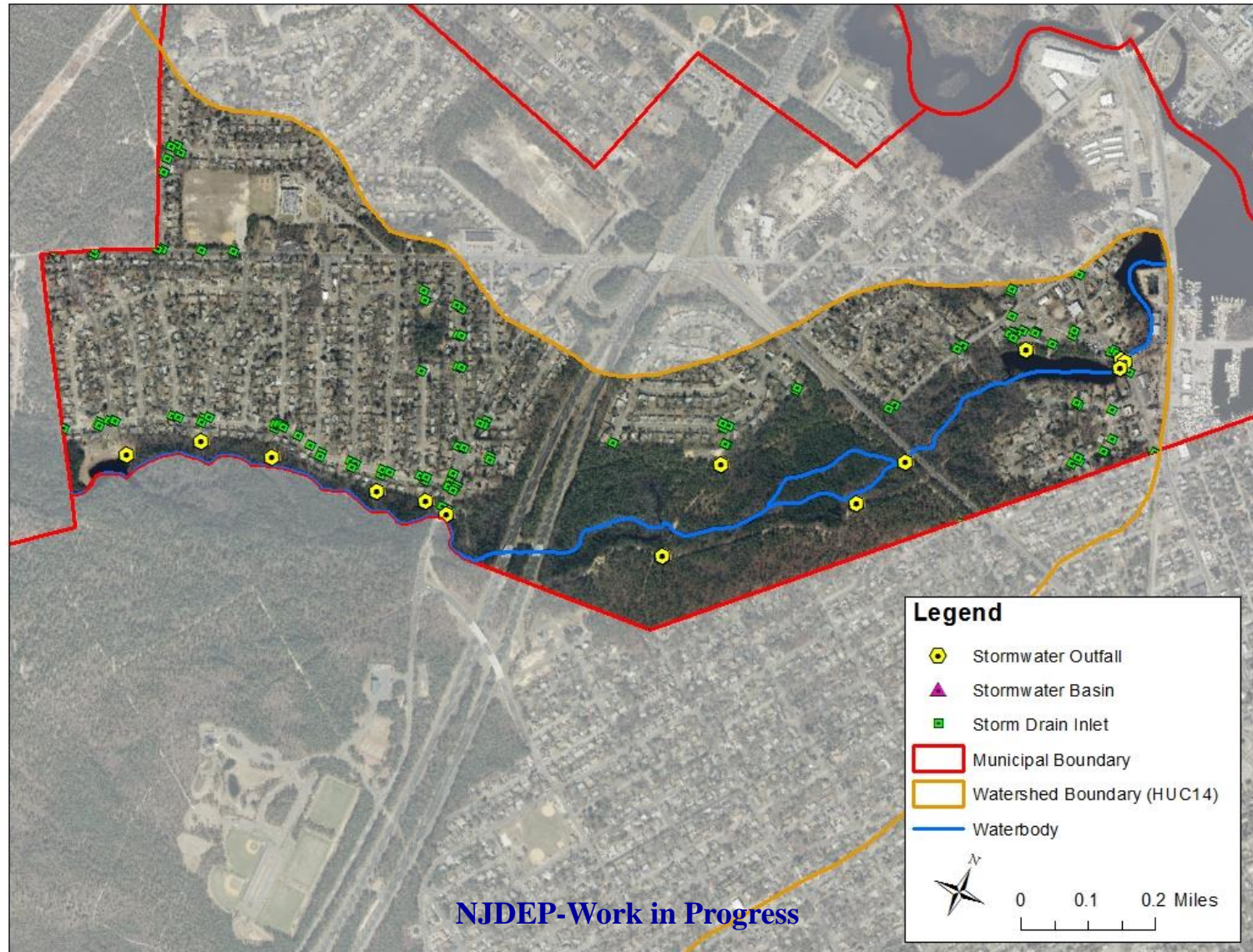
09:23:06am

# Stormwater Inventory Map



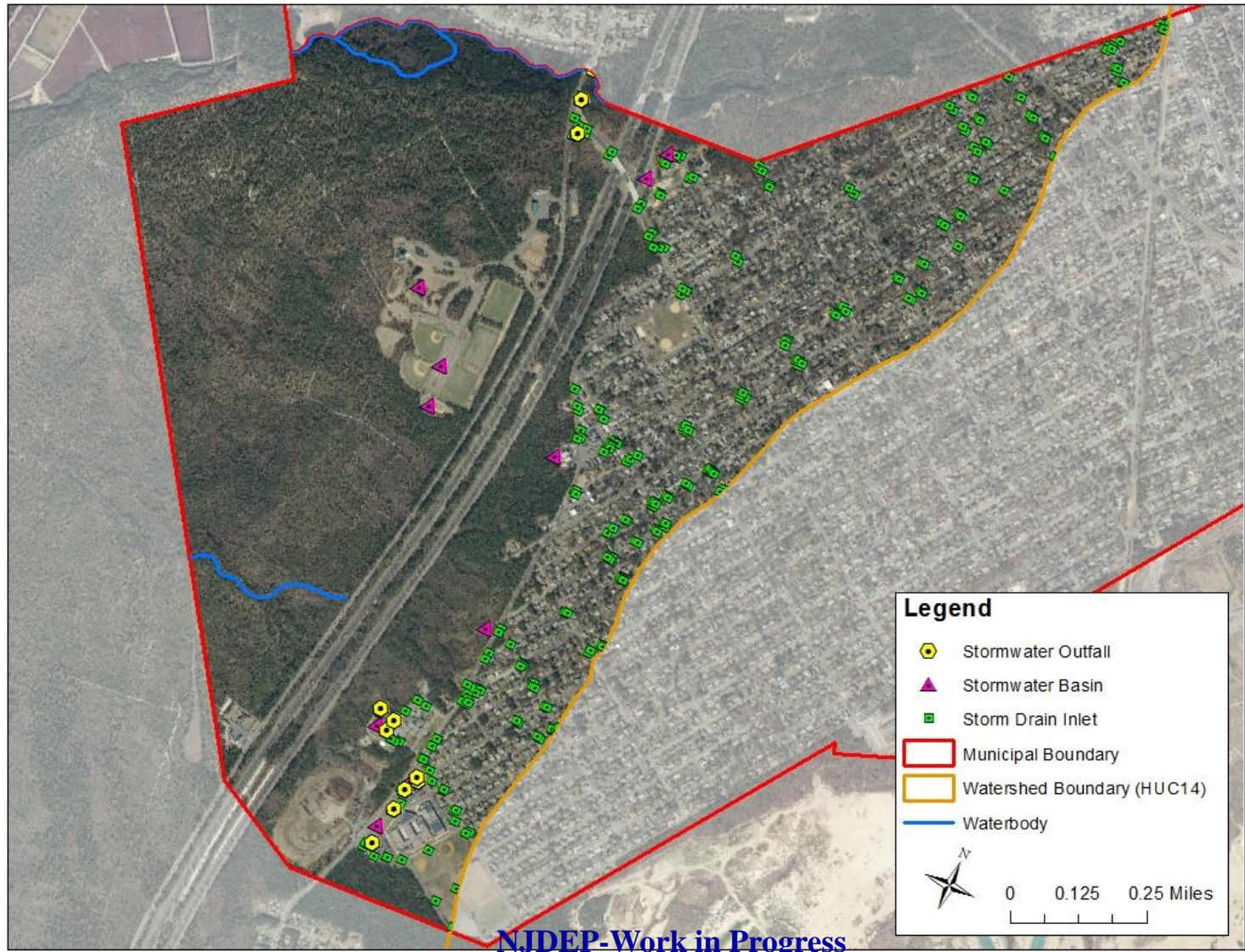


# Stormwater Inventory Map – Study Area Within Municipality 1





# Stormwater Inventory Map – Study Area Within Municipality 2



# MS4 Mapping and Inventory Requirements

- ✓ Mapping tool meets MS4 mapping and inventory requirements

# **MS4 Inspection and Maintenance Requirements for Storm Drain Inlets**

- ☐ **NJDEP Storm Drain Inlet Mapping and Inventory Data Dictionary Tool Example**
  - ☐ Municipalities shall retrofit certain municipally owned or operated storm drain inlets to meet the standard in attachment C.

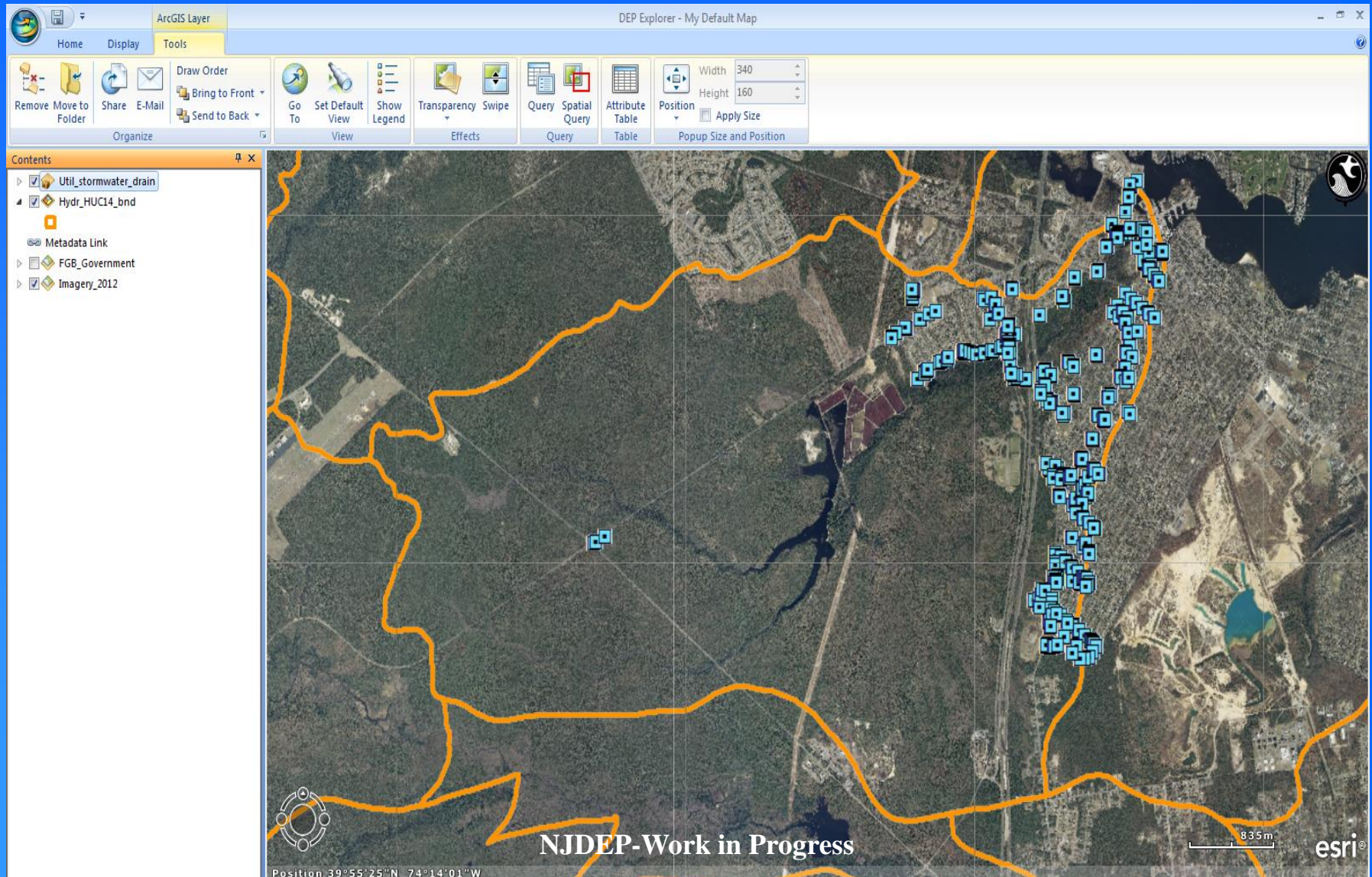


# **MS4 Inspection and Maintenance Requirements for Storm Drain Inlets**

## **☐ NJDEP Storm Drain Inlet Mapping and Inventory Data Dictionary Tool Example**

- ✓ Municipalities shall retrofit certain municipally owned or operated storm drain inlets to meet the standard in attachment C.
- ✓ Municipalities shall enforce an ordinance to require entities to retrofit existing privately owned storm drain inlets to meet the standard in attachment C.
- ✓ Municipalities shall label all storm drain inlets and shall also maintain the legibility of those labels.
- ✓ Municipalities shall inspect all municipally owned and operated catch basins for accumulated sediment, trash, and debris and clean those basins and inlets where sediment, trash, or debris is present.

# MS4 Inspection and Maintenance Requirements for Storm Drain Inlets





# MS4 Inspection and Maintenance Requirements for Storm Drain Inlets

The screenshot displays the ArcGIS Desktop interface. The main map area shows an aerial view with orange lines representing storm drain networks and blue squares representing storm drain inlets. A 'Query Builder - Util\_stormwater\_drain' dialog box is open in the center. The 'Fields' list on the left includes 'Curb Opening Retro - String', which is selected. The 'Operators' column shows '<=' and the 'Value' column shows 'No'. The 'Test' button is highlighted, and a message states 'More than 100 features match the query.' The 'Contents' pane on the left lists layers: 'view 1', 'Util\_stormwater\_drain', 'Hydr\_HUC14\_bnd', 'Metadata Link', 'FGB\_Government', and 'Imagery\_2012'. The bottom of the screen features a scale bar (0 to 835m), a north arrow, and the text 'NJDEP-Work in Progress'. The Esri logo is in the bottom right corner.

**Query Builder - Util\_stormwater\_drain**

Fields	Operators	Value
Owner - String	=	No
Permit Type - String	<>	
Storm Drain ID - String	LIKE	
Drain Description - String	>	N/A
Drain Location - String	>=	No
<b>Curb Opening Retro - String</b>	<=	Not Applicable
Bicycle Safe Grate - String		Yes
Drain Labeled - String	OR	
General Comments - String	NOT	
Inspector - String		
Type Area Drained - String		
Drain Condition - String		

Select features where...

"Curb\_Opening\_Retro" = No

Test Clear More than 100 features match the query.

[Help about Query Editor](#) OK Cancel

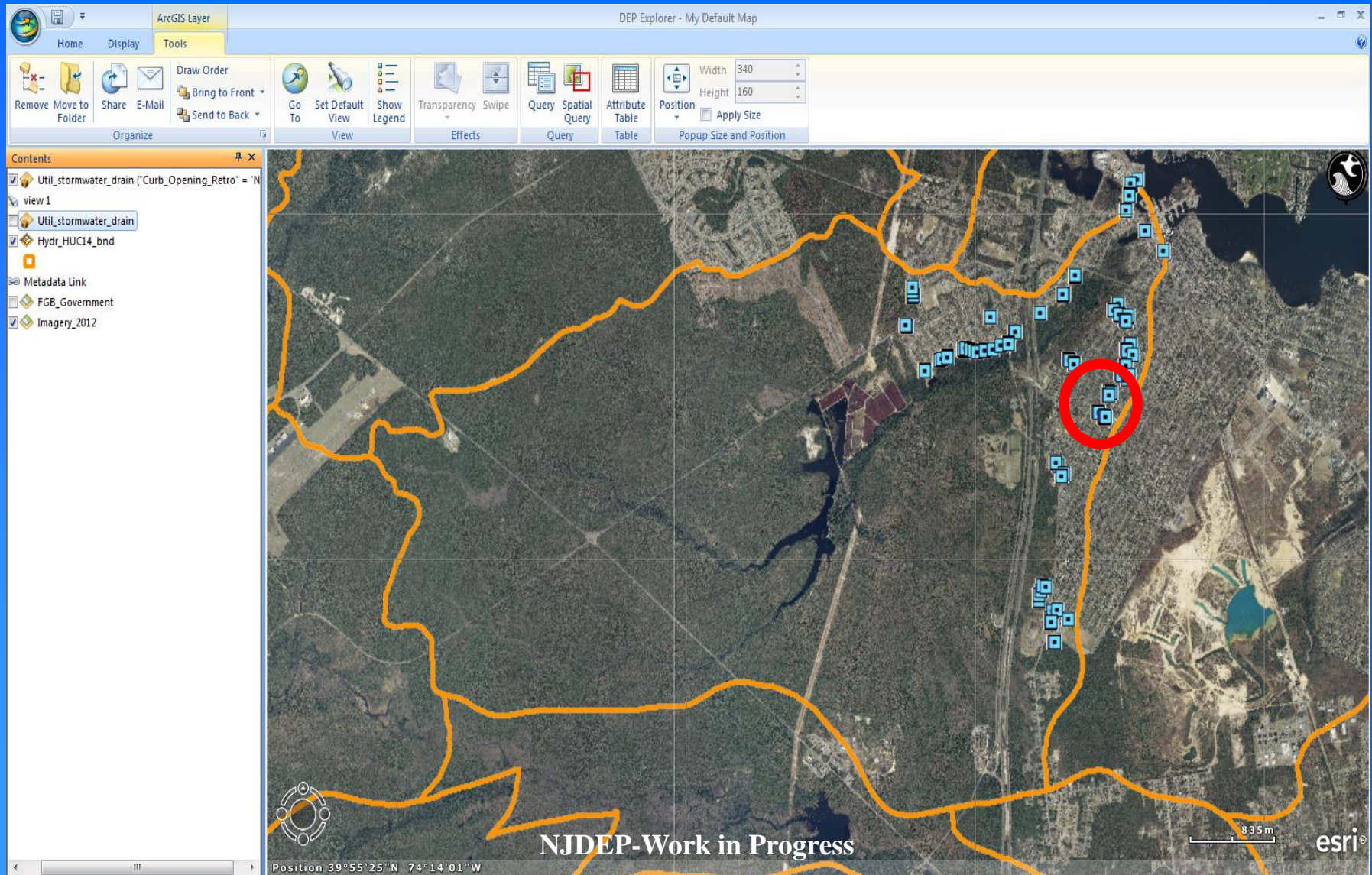
**NJDEP-Work in Progress**

Position 39°55'25"N 74°14'01"W

835m esri®



# MS4 Inspection and Maintenance Requirements for Storm Drain Inlets





# MS4 Inspection and Maintenance Requirements for Storm Drain Inlets

The screenshot displays the ArcGIS Explorer interface with a map of a residential area. A pop-up window titled 'Storm Drain' is open, showing the following data:

Storm Drain	
Permit Type	MS4
Storm Drain ID	
Drain Description	Combination Inlet
Drain Location	Street
Curb Opening Retro	No
Bicycle Safe Gate	No
Drain Labeled	Yes
General Comments	
Inspector	ball
Date	8/13/2014
Type Area Drained	Suburban
Drain Condition	Good
Label Condition	Good
Drain Grate Clogged	Yes
Storm Drain Comment	
Drain BMP Present	No
Drain BMP Type	
Drain BMP Effective	
BMP Comment	
Debris Present	Yes
Debris Type	Floatables > 2" dia
Debris Source	Local Residences
Debris Comment	area experienced flooding overnight
Standing Water	No
Outlets Clogged	No
PrecipLast24hrs	Yes
SnowMeltLast24hrs	No
DryWeatherFlow	No
Flow Color	
Flow Odor	
Flow Foam	

Position 39°55'57"N 74°12'03"W



# Mapping Study Findings In Relation To MS4 Requirements:





# MS4 Inspection and Maintenance Requirements for Storm Drain Inlets

The screenshot displays the ArcGIS Explorer interface with an aerial map. A popup window for a 'Storm Drain' feature is open, showing the following attributes:

Storm Drain	
Drain Condition	Good
Label Condition	Good
Drain Grate Clogged	Yes
Storm Drain Comment	
Drain BMP Present	No
Drain BMP Type	
Drain BMP Effective	
BMP Comment	
Debris Present	Yes
Debris Type	Organics
Debris Source	Vegetation
Debris Comment	
Standing Water	No
Outlets Clogged	No
PrecipLast24hrs	Yes
SnowMeltLast24hrs	No
DryWeatherFlow	No
Flow Color	
Flow Odor	
Flow Foam	
Flow Sheen	
Flow Comment	
Illicit Connection	No
Connection Source	
Connection Comment	
Photo Link	
Maintenance Required	Yes
Maintenance Code	General Maintenance
Maintenance Comment	
Maintenance Complete	
Maintenance_Date	
Post Photo Link	

A red box highlights the 'Maintenance Required' and 'Maintenance Code' fields, with a red arrow pointing to the 'General Maintenance' value. The background map shows a residential area with several storm drain inlets marked by blue squares. The bottom status bar indicates the position as 39°55'56"N 74°12'06"W.

# **MS4 Inspection and Maintenance Requirements for Stormwater Outfalls**

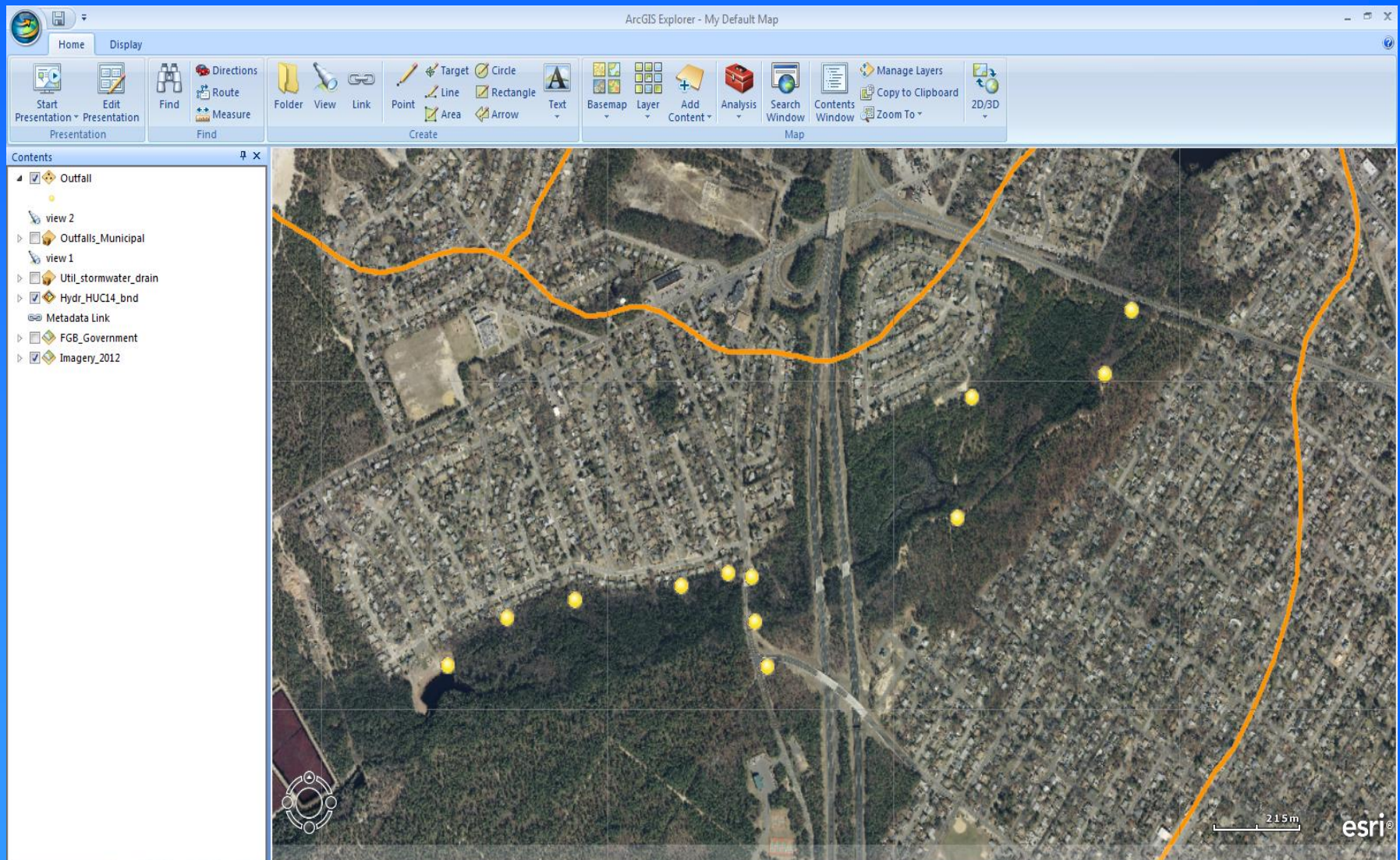
- ❑ NJDEP Stormwater Outfall Mapping and Inventory Data Dictionary Tool Example**
  - ❑ Municipalities shall develop/maintain a program to detect, remediate, and maintain any localized stream bank scouring from stormwater outfall pipes (tidal and non-tidal).

# **MS4 Inspection and Maintenance Requirements for Stormwater Outfalls**

- ❑ NJDEP Stormwater Outfall Mapping and Inventory Data Dictionary Tool Example**
  - ✓ Municipalities shall develop/maintain a program to detect, remediate, and maintain any localized stream bank scouring from stormwater outfall pipes (tidal and non-tidal).
  - ✓ Municipalities shall perform/update a physical inspection of all municipality owned and operated outfall pipes (tidal and non-tidal) which discharge to a surface water body.
  - ✓ Municipalities shall investigate dry weather flows discovered during routine inspections and maintenance of the MS4.
  - ✓ Municipalities shall visually assess discharge outfalls on a periodic basis. (Sheen, foam, odor, or discoloration)



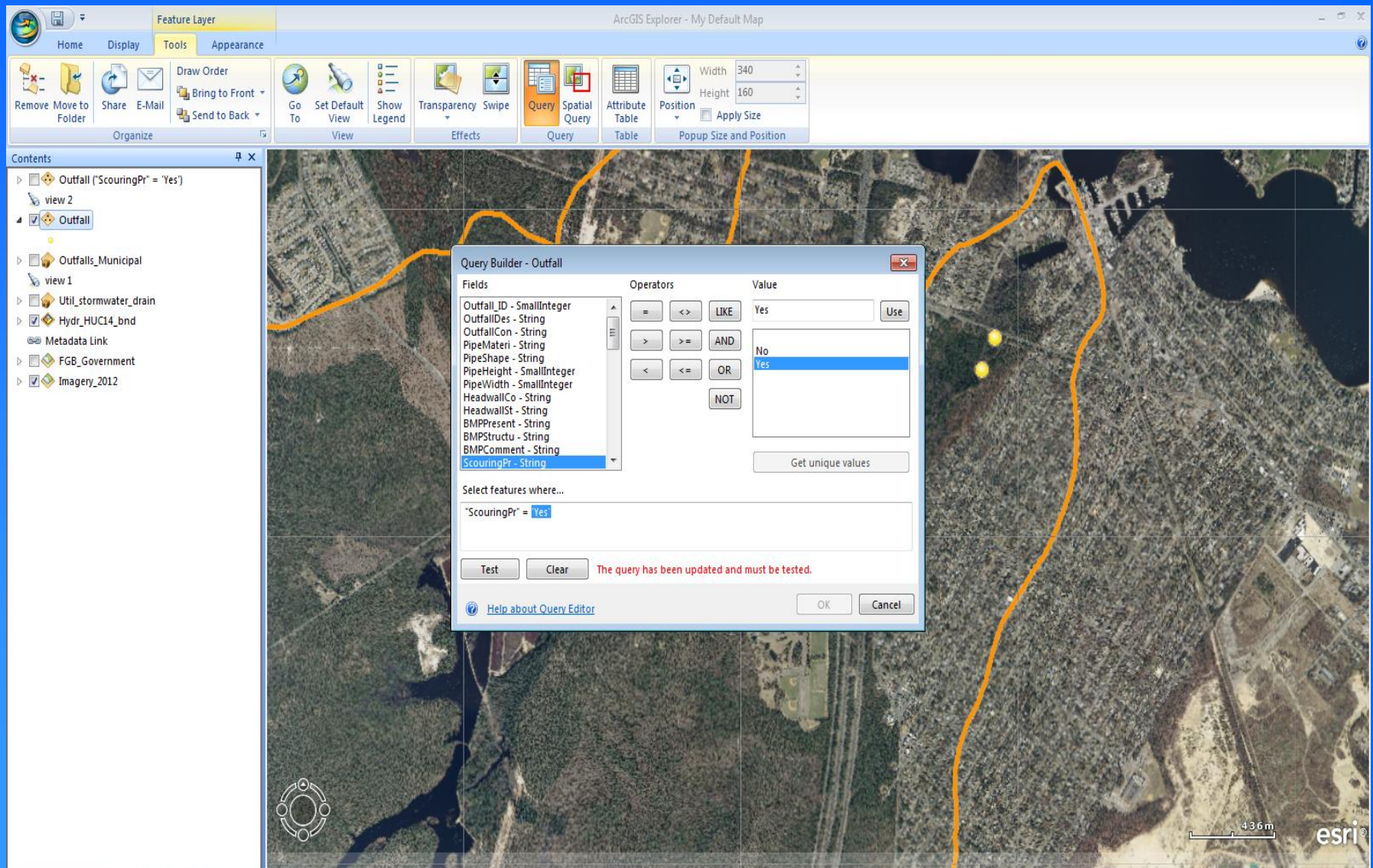
# MS4 Inspection and Maintenance Requirements for Stormwater Outfalls



**NJDEP-Work in Progress**

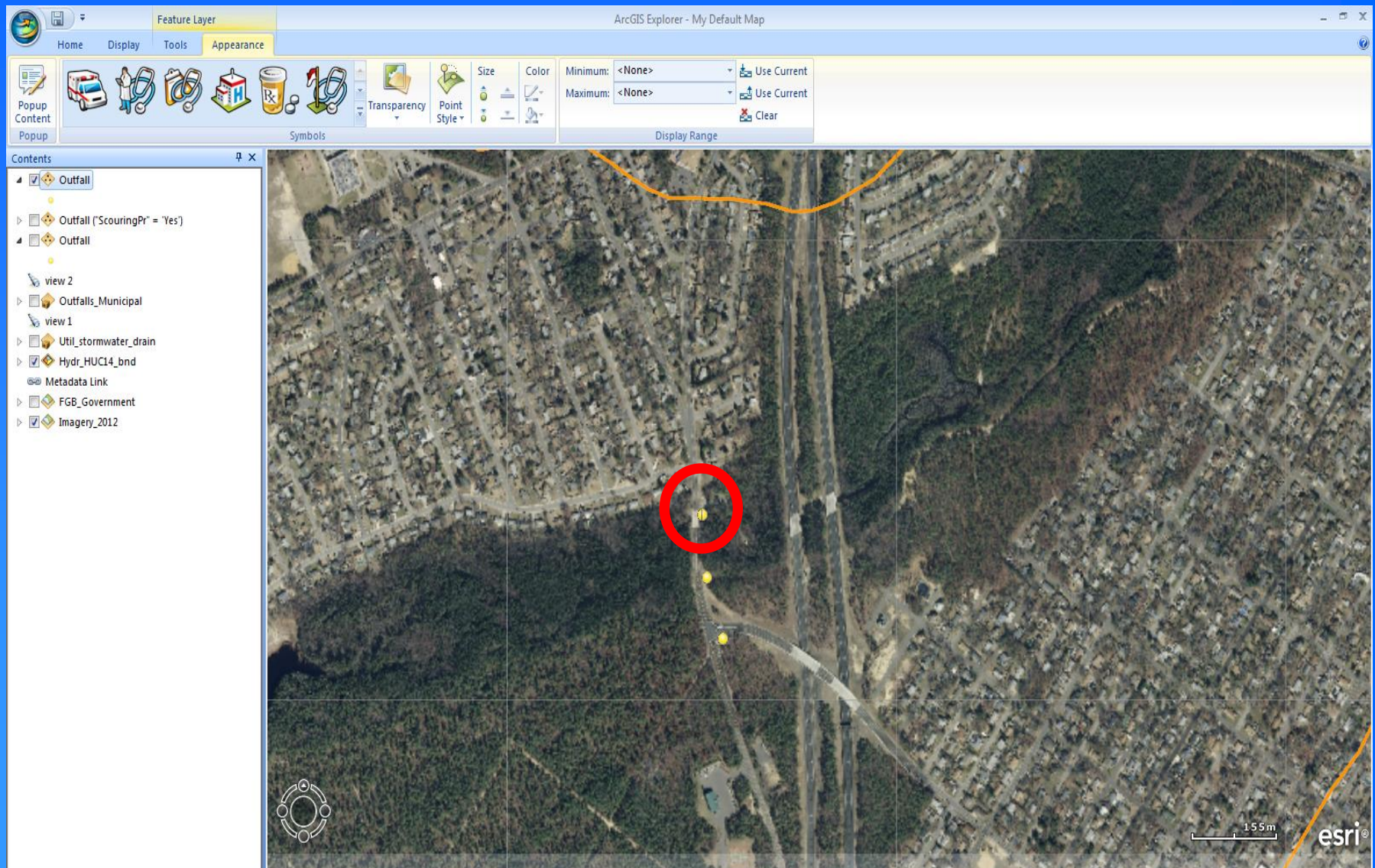


# MS4 Inspection and Maintenance Requirements for Stormwater Outfalls





# MS4 Inspection and Maintenance Requirements for Stormwater Outfalls





# MS4 Inspection and Maintenance Requirements for Stormwater Outfalls

The screenshot displays the ArcGIS Explorer interface with an aerial map. A yellow point representing an outfall is visible on the map. A red arrow points to the 'ScouringPr' field in the attribute table, which is set to 'Yes'.

**Contents**

- Outfall
- Outfall ("ScouringPr" = "Yes")
- view 2
- Outfalls\_Municipal
- view 1
- Util\_stormwater\_drain
- Hydr\_HUC14\_bnd
- Metadata Link
- FGB\_Government
- Imagery\_2012

**Outfall**

Outfall_ID	1
OutfallDes	Pipe in headwall
OutfallCon	Good
PipeMateri	Concrete
PipeShape	Circular
PipeHeight	40
PipeWidth	40
HeadwallCo	No Headwall
HeadwallSt	Steel bulkhead
BMPPresent	No
BMPStructu	None
BMPComment	
ScouringPr	Yes
ScouringCo	
TypeAreaDr	Roadway
TypeAreaRe	Stream/River
PrecipLast	No
TimeRain	
SnowMeltLa	
Flowing	No
DryWeather	No
Flow_Color	
Flow_Odor	
Flow_Foam	
Solids_Flo	Yes
Flow_Comme	
DateInspec	8/20/2014 12:00:00 AM
Inspector	ball
Comments	
Photo	
Date	8/20/2014 12:00:00 AM
Time	8:00:00 AM



# MS4 Inspection and Maintenance Requirements for Stormwater Outfalls





# MS4 Inspection and Maintenance Requirements for Stormwater Outfalls

The screenshot shows the ArcGIS Explorer interface with a map of stormwater outfalls. A popup window is open for a selected outfall, displaying the following data:

Outfall	
PipeWidth	40
HeadwallCo	No Headwall
HeadwallSt	Steel bulkhead
BMPPresent	No
BMPStructu	None
BMPComment	
ScouringPr	Yes
ScouringCo	
TypeAreaDr	Roadway
TypeAreaRe	Stream/River
PrecipLast	No
TimeRain	
SnowMeltLa	
Flowing	No
DryWeather	No
Flow_Color	
Flow_Odor	
Flow_Foam	
Solids_Flo	Yes
Flow_Comme	
DateInspec	8/20/2014 12:00:00 AM
Inspector	ball
Comments	
Photo	
Date	8/20/2014 12:00:00 AM
Time	09:23:06am
Max_PDOP	3.3
Maintenance Required	Yes
Maintenance Code	General Maintenance
Maintenance Comment	
Maintenance Complete	
Maintenance_Date	

A red arrow points to the 'Maintenance Required' field, which is highlighted in red. The map shows a residential area with a road and a stream. The popup window is titled 'Outfall' and has a close button (X) in the top right corner.

# **MS4 Illicit Discharge Elimination Requirements**

- ❑ NJDEP Illicit Discharge Mapping and Inventory Data Dictionary Tool Example**
  - ❑ Municipalities shall establish/maintain an ongoing program to detect and eliminate illicit connections in accordance with the procedures found in Attachment F of the permit.



# MS4 Illicit Discharge Elimination Requirements





# MS4 Illicit Discharge Elimination Requirements



08/15/2014 P-Work in Progress

# MS4 Illicit Discharge Elimination Requirements

## **☐ NJDEP Illicit Discharge Mapping and Inventory Data Dictionary Tool Example**

- ✓ Municipalities shall establish/maintain an ongoing program to detect and eliminate illicit connections in accordance with the procedures found in Attachment F of the permit.
- ✓ **By using the data dictionary associated with storm drain inlets, inspections turning up consistent debris in municipally owned storm drain inlets can alert municipalities of illicit discharges.**
- ✓ **The elimination of illicit discharges can decrease annual stormwater infrastructure upkeep and maintenance costs.**



# **MS4 Additional Requirements**

- ❑ **NJDEP mapping and inventory data dictionary tool can also assist in meeting the following MS4 requirements.**
  - ✓ Municipalities shall implement Public Education and Outreach Program that focuses on educational and pollution prevention activities to involve the public in reducing pollutants in stormwater.
  - ✓ Municipalities shall ensure adequate long-term operation and maintenance of any stormwater management measures (e.g. stormwater management basins)...
  - ✓ Municipalities shall continue to implement a stormwater facility maintenance program for cleaning and maintenance of all municipally owned and operated stormwater facilities...

# Summary

- ✓ Meets current outfall mapping requirements and any potential requirements under MS4 permit renewal.
- ✓ Assists in meeting maintenance and inspection requirements for outfalls, storm drain inlets, and stormwater management measures.
- ✓ Assists in identifying and eliminating illicit discharge requirements.
- ✓ Assists in education and community outreach requirements
- ✓ Assists in meeting stormwater audit requirements



# Questions?

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